

# **MBTA Back Bay/South End Groundwater Action Plan and Recommendation of Long Term Solution**

**Groundwater Action Plan Team**

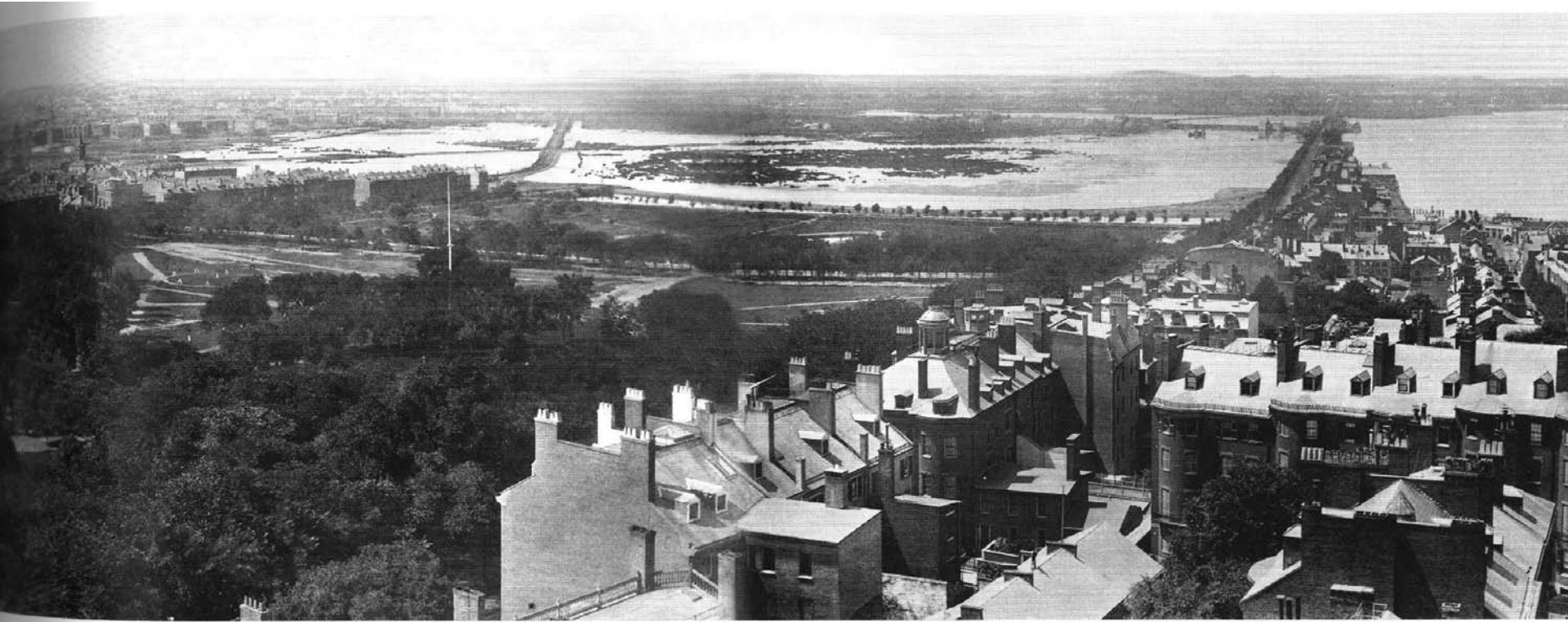
# Topics to Cover

- **Groundwater System in Back Bay/South End**
- **Groundwater Action Plan**
- **MBTA's Short Term Solution**
- **MBTA's Long Term Solution**

# Groundwater in Back Bay/South End Fill

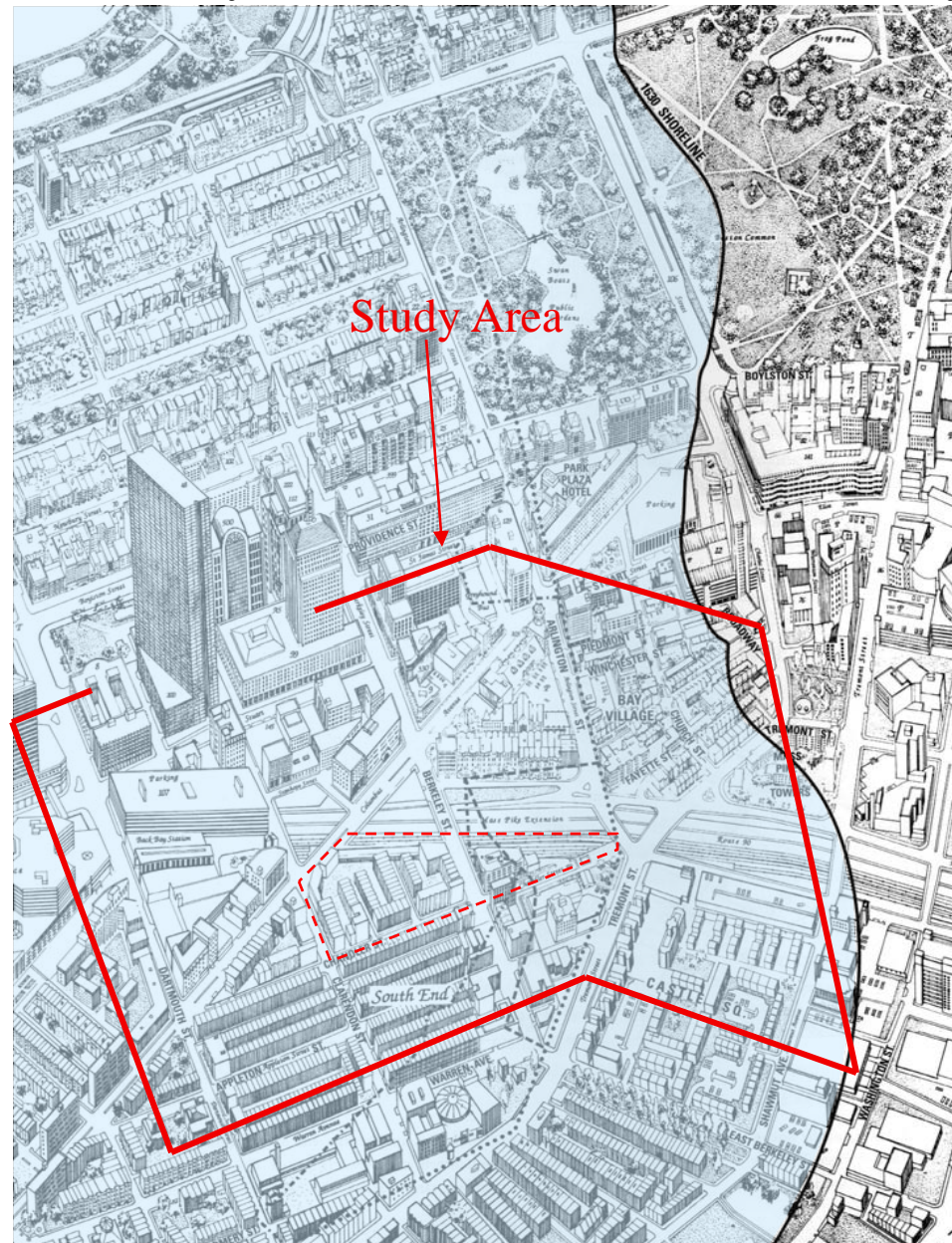
The groundwater in the Back Bay fill is, for the most part, contained within certain low-permeability boundaries that form the Back Bay. Addition or removal of groundwater in one location will affect wide areas within the fill.

# 1858 Photograph of Back Bay taken from the State House





# 1992 Bird's Eye View with 1630 Shoreline of Back Bay



Massachusetts Bay Transportation Authority

***Driven by Customer Service***

From *Gaining Ground* (2003), Figure 7.9 (Courtesy of Kane Maps)



# **Groundwater in Back Bay/South End Fill**

## **Current sources of inflow to groundwater:**

- Leakage from Charles River and Fens
- Infiltration from rainfall
- Any leaky water mains
- Leaky sewer pipes above water table
- Existing recharge systems

# **Groundwater in Back Bay/South End Fill**

## **Current causes of low groundwater levels:**

- Loss of infiltration due to surface cover
- Leakage into utilities below groundwater
- Construction dewatering
- Sump pumping from deep basements
- Pumping for transportation corridors
- Sump pumping from residences
- Flow into lower sand layer

# **MBTA Groundwater Action Plan Team**

**BGWT**

**BWSC**

**CITY OF BOSTON**

**CITYWIDE GET**

**MBTA**

**MTA**

**STATE EEA**



# **MBTA Groundwater Action Plan**

## **- Guiding Principles -**

### **The Long-Term Solution shall:**

- hold paramount public safety, health, and welfare;
- effective without significantly impacting abutting infrastructure;
- durable and relatively maintenance-free;
- sound and practicable
- environmentally beneficial;
- financially responsible; and
- selected and implemented in open and honest manner.

# Objectives for MBTA's Groundwater Action Plan

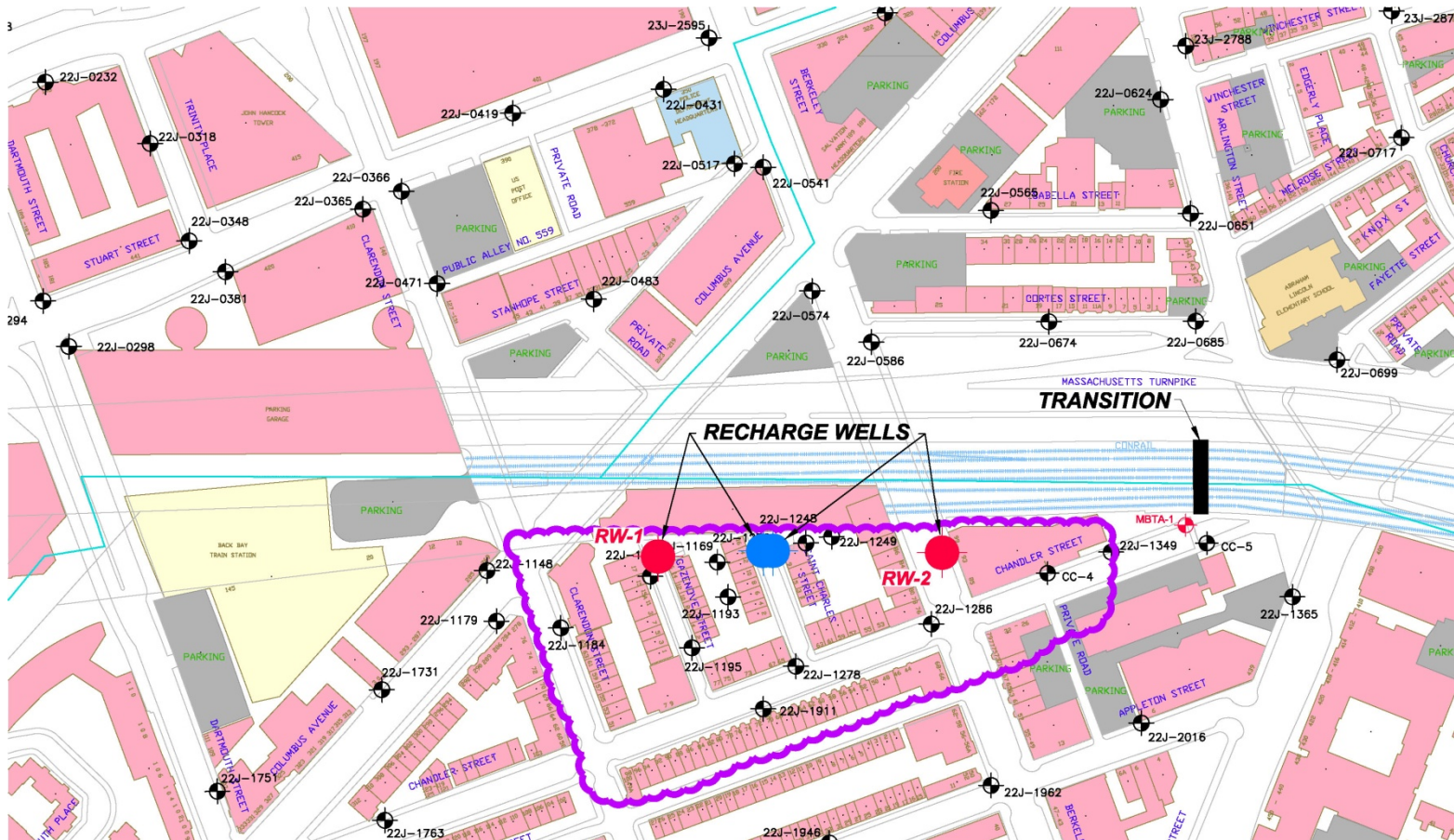
## The Long-Term Solution Objectives:

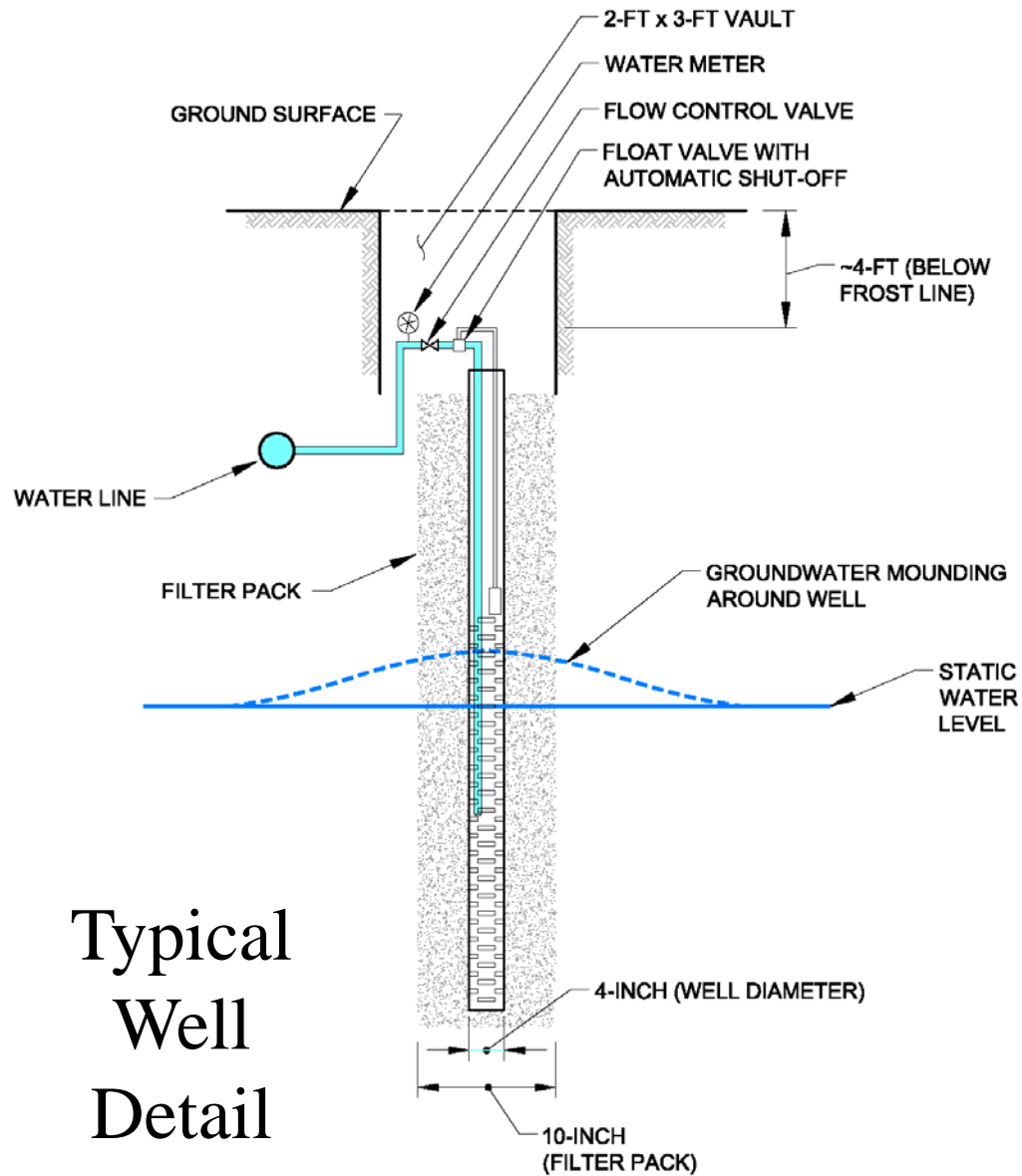
1. **Primary:** Raise the groundwater levels along the Southwest Corridor near Back Bay Station.
2. **Secondary:** Seek to increase groundwater levels to Elevation 5 BCB along the Southwest Corridor near Back Bay Station.

# Purposes of MBTA's Short Term Solution

- **Raise** groundwater levels in an area where they have been low for several years.
- Make in-situ **test** of a short term recharge system.
- Make measurements needed to design and **estimate cost** of permanent groundwater mitigation systems.
- **Identify** nearby **causes of groundwater lowering**.

# View of Short Term Recharge System near Back Bay Station





Typical  
Well  
Detail



# Steps to Select a Long Term Solution

- Establish Action Plan Team.
- Eliminate infeasible options.
- Obtain data to evaluate remaining options.
- For remaining options, prepare preliminary designs and reasonable cost estimates for construction and maintenance of each option.
- Make detailed evaluation of selected options.
- Select recommended solution.



# Peer Advisory Group

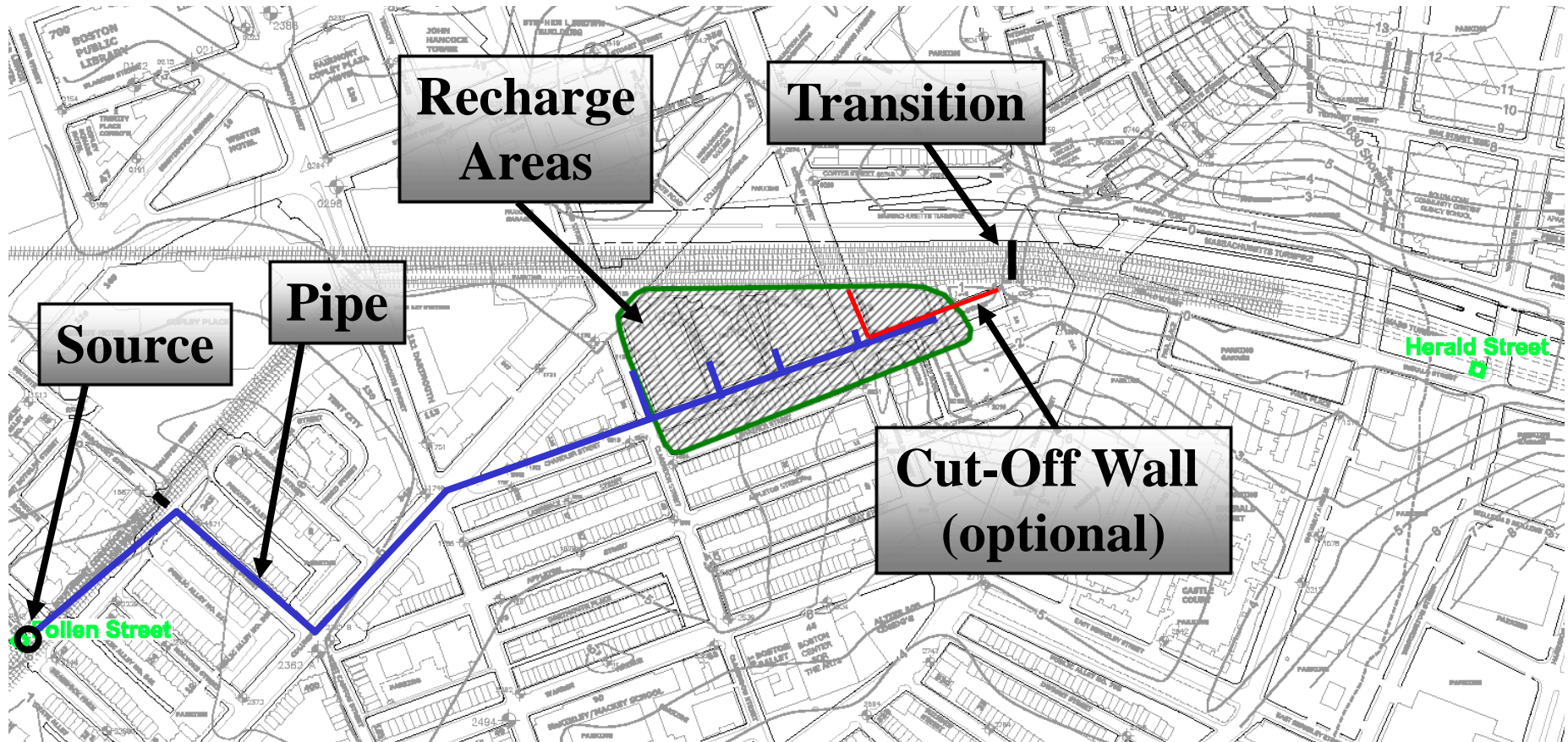
- Edmond Hunter, MBTA
- James Lambrechts, Wentworth
- John P. Sullivan, BWSC
- Steve Poulos, GEI

# Recommended Long Term Solution

## Recommendation by Peer Group

- Design a groundwater recharge well system and a linear cutoff wall on the east side of the transportation corridor, since the groundwater is being lost in that direction. Use a groundwater flow model of the site to help design the system.
- Use recharge water that is available from the MBTA's Follen Street Pumping Station.
- After the recharge system is installed and operating, use the groundwater model and the data collected from the operating recharge system to evaluate whether the cutoff wall is needed. If so, construct the cutoff wall.
- Arrange the funds needed to maintain the recharge system.

# Recharge System Conceptual Plan

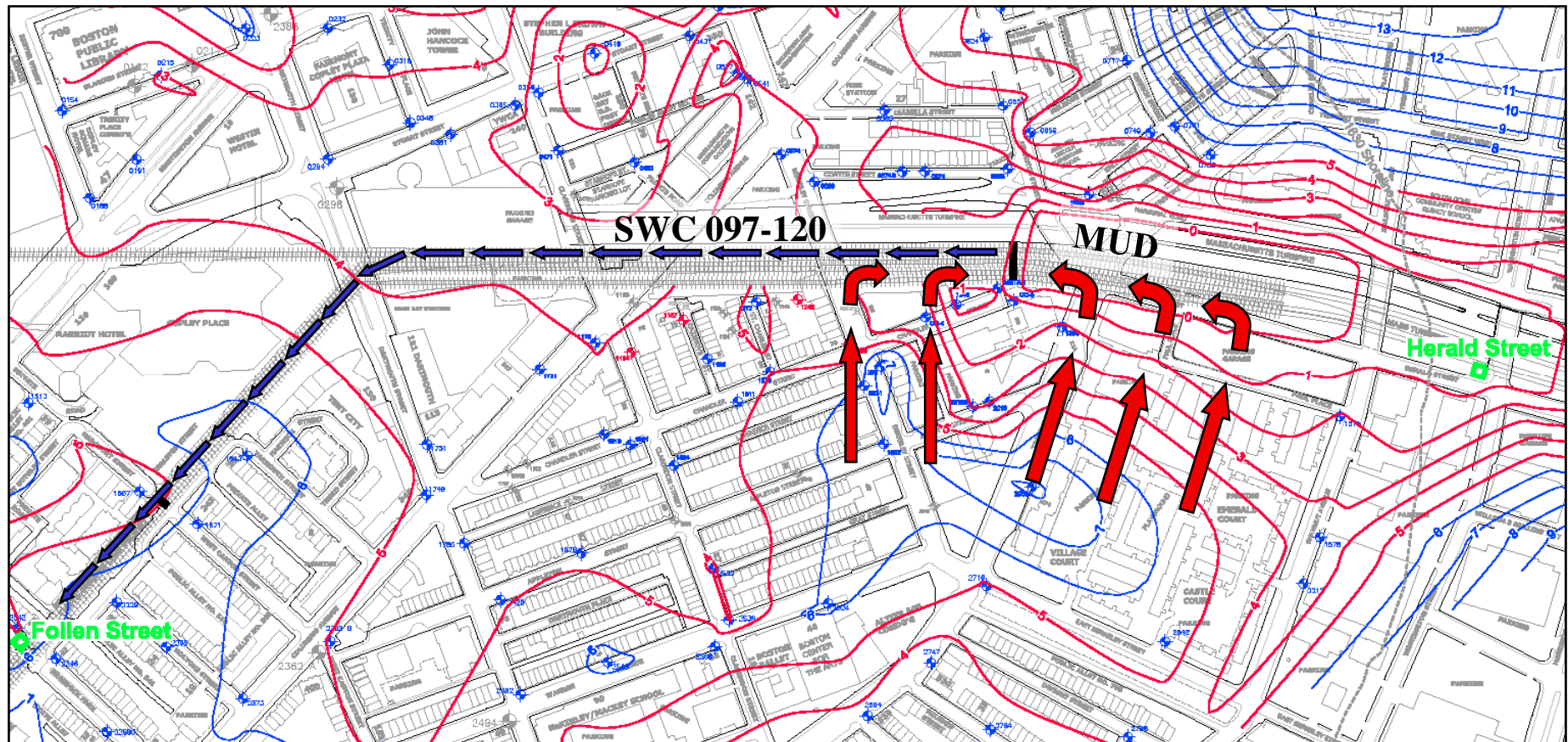


# MUD Line

- **Federal Railway Administration Design/Installation**
- **Railroad is underlain by a membrane that leaks and that has a top elevation of 3 ft. (BCB)**
- **Leakage may occur along MUD and then enters SWC drainage system at the transition slab**

# GEI Groundwater Contours 11/06

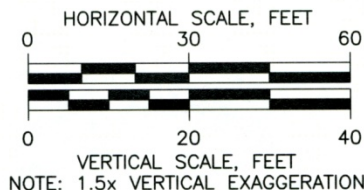
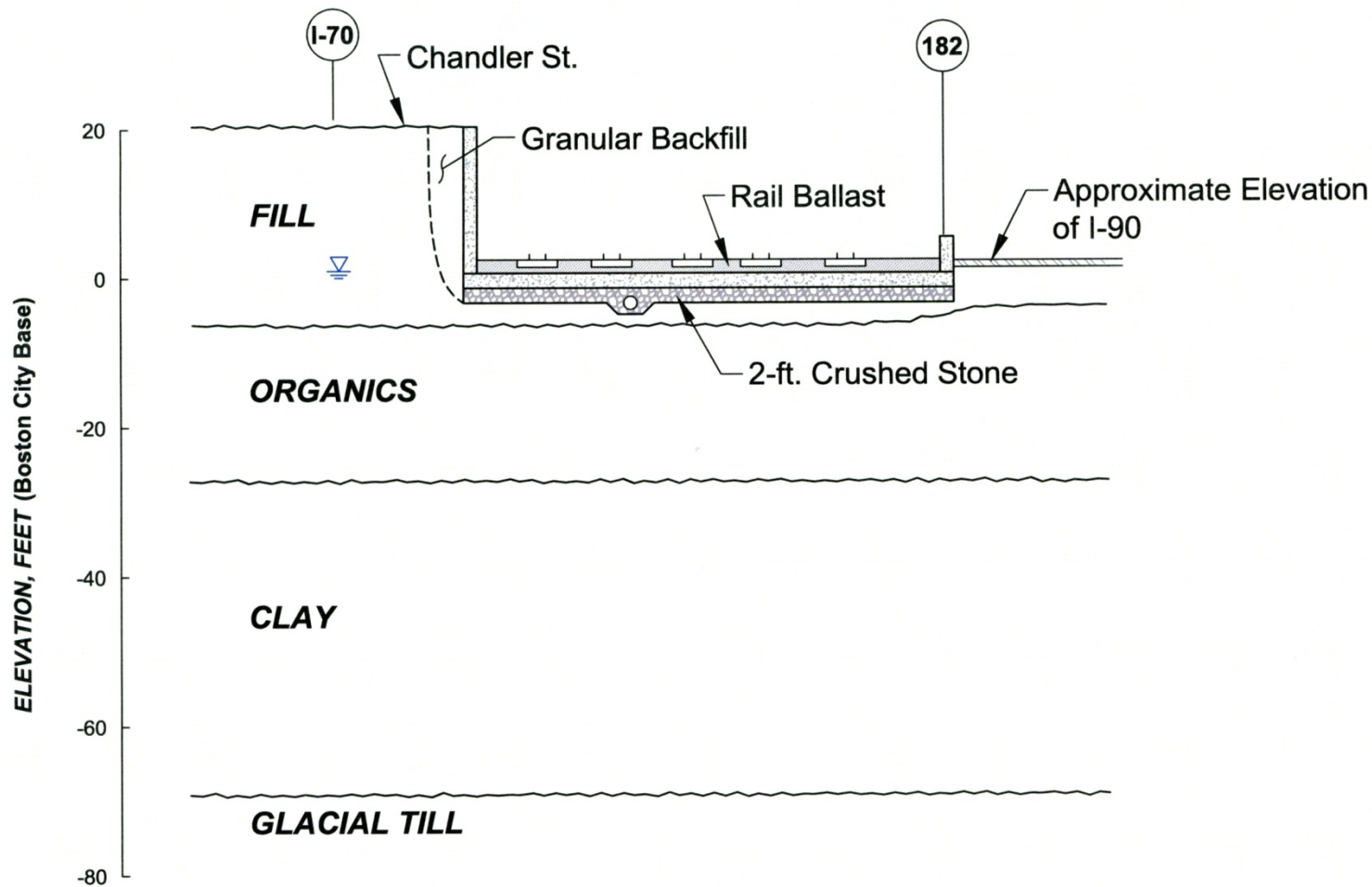
Based on data provided by Boston Groundwater Trust for November 2006



## Assumption: Leaking MUD Line



# Transverse Profile of SWC



March 2007



# **Summary Long Term Solution**

## **As Part of Orange Line Tunnel Repair Program**

- Continue to maintain the present recharge system.
- Install Cutoff Wall along Mudline Tunnel Interface Location
- Conduct groundwater model study to evaluate effectiveness of cutoff wall.
- If required, provide storm water from the MBTA's Follen Street Pumping Station to the present recharge system.
- Continue to arrange the funds needed to maintain the recharge system.